

External Adjustments under Increasing
Integration: Japanese Perspective

Eiji Ogawa
Kentaro Iwatsubo

March 2009
Discussion Paper No.0830

GRADUATE SCHOOL OF ECONOMICS
KOBE UNIVERSITY

ROKKO, KOBE, JAPAN

External Adjustments under Increasing Integration: Japanese Perspective^{*}

Eiji Ogawa^a and Kentaro Iwatsubo^b

First version: March 9, 2008

This version: March 21, 2009

^{*} This paper is a revised version of presentation paper that was prepared for PEO/Structure Specialist Meeting on “External Adjustments under Increasing Integration” that is held in Osaka, September 6-7, 2008. The authors appreciate Akira Kohsaka (University of Osaka) and other participants for useful comments.

^a Professor, Graduate School of Commerce and Management, Hitotsubashi University.
E-mail: ogawa.eiji@srv.cc.hit-u.ac.jp.

^b Associate professor, Graduate School of Economics, Kobe University, E-mail: iwatsubo@econ.kobe-u.ac.jp.

1. Introduction

Global imbalances, which include current account surpluses of Japan, other East Asian countries, and oil exporting countries as well as current account deficit of the United States¹, have been increasing in the recent years. It is pointed out that the current account deficit of the United States corresponds to Japan, China, and East Asia. Bernanke (2005) pointed out that the current global imbalances are attributed to “saving glut” in East Asia. Figure 1 shows that the movements in current account deficit (its ratio in terms of GDP) of the United States have been symmetric with those in the current account surpluses (ratio in terms of GDP) of Japan and East Asia.

Japanese current account surplus was US\$ 21 billion. It is one of the largest current account surpluses across the world while especially China had US\$ 372 billion in 2007. A sum of both the countries corresponds to most of the US current account deficits (US\$ 731 billion). The current account surplus of Japan recorded the highest (4% of GDP) in 1986. Japan has been faced with an increasing current account surplus since the latter half of 1990s like a mirror image of increasing current account deficit of the United States. Its current account surplus stood recently at nearly 4% of GDP. The current level of the current account deficit is almost the same ratio to GDP which Japan experienced in mid-1980s when the Japanese yen was rapidly depreciated against the US dollar after the Plaza Accord in September 1985.

Economic integration is globally developing further in forms of widening and deepening international trade, capital, and financial transactions. At the same time, the economic integration is developing further also inside of such regions as the European Union (EU) and East Asia. Especially in East Asia, further widening and deepening international trade induce intra-regional capital flows, which include foreign direct investments (FDI), to establish production networks in the manufactures such as automobile manufactures. Not only FDI but also international portfolio investments and international bank loans are increasing in the globalization.

The increases in FDI, international portfolio investments and international bank loans accumulate external assets in investor countries. The accumulation of external assets increases dividends and interest receipts from foreign countries as a part of income account in the current account. The share of income account in the current account has a tendency to increase for the countries accumulating external asset. The tendency might decrease the exchange rate effect on current account through their

¹ See Ahmed and Rogers (1995), Kim and Roubini (2003), Mann (2002), Matsubayashi (2005), Obstfeld and Rogoff (2007), Ogawa and Kudo (2007a, b) for issues related with the US current account deficits.

exports and imports.

On one hand, the establishing production networks due to FDI increases international trade volumes of manufactured goods such as parts and semi-final goods as well as final goods. Also it makes international trade complex in the region. Thus, the economic integration seems to change the responses of current account imbalances to exchange rates. The establishing production networks in East Asia might change the responses of current account imbalances to exchange rates not only for Japan but also for East Asia as a whole.

The first objective of this paper is to investigate how much realignment of currencies is needed for adjustments to the current account imbalances of Japan compared with those of East Asia as a whole, given the productions networks in East Asia.² The analyses show that the large realignments of the Japanese yen and other East Asian currencies would be needed if the adjustments are completed with only exchange rates. We also find that the degree of the exchange rate adjustments of East Asia as a whole is smaller than that of Japan only.

The second objective is to investigate why the adjustment becomes more difficult if we rely only on the exchange rates in Japan. It is supposed that the exchange rate elasticity of the current account might have been decreasing over time. Or the increasing part of Japanese income account surplus in the current account surplus might have altered the response of the current accounts to the exchange rates because establishing production network in East Asia changed trade patterns, the reactions of international trade to exchange rates, and the composition of the current account of Japan due to the accumulation of external assets. We find that Japanese outward FDI has increased independently with the exchange rate and that a ratio of income account to current account has increased due to the FDI. The findings imply that the Japanese economy has an increasing structural part of the Japanese current account which does not respond to the exchange rate movement.

This paper consists of the following sections. In the next section we observe the characteristics of Japanese current account. In Section 3, vector auto-regression (VAR) models are employed to investigate effects of exchange rate on current account of Japan.

² There is the large literature on exchange rates and trade balances via trade elasticity and exchange rate pass-through (Dixit (1989), Marston (1990), Campa (2002), Ohtani, Shiratsuka, and Shirota (2003), Parsons and Sato (2006)). This paper focuses on indirect effects of the increasing FDI and implicitly the establishing production networks on the relationship between exchange rates and current accounts rather than the pass-through effects under the main theme “External Adjustments under Increasing Integration.”

In Section 4, VAR models are used to investigate effects of exchange rates on current account of East Asia including Japan and East Asia excluding Japan. In Section 5 we compare the analytical result regarding exchange rate adjustments of current account between Japanese and East Asian cases. In section 6, we conclude this paper

2. The Characteristics of Japanese Current Account

In this section, we observe data on Japanese current account and the related economic variables to draw characteristics of the Japanese current account.

Figure 2 shows the Japanese current account and its composition which include trade account, service account, and income account. It is found that the Japanese current account surplus has shown several large swings since 1985. In addition, they have an upward trend from 1996.

The Japanese trade account surplus has decreased since 2004 while Japanese economy has continuous increases in the income account surplus which is related with the accumulation of external net assets in such background that Japanese economy has been conducting FDI as well as international portfolio investments to foreign countries, especially neighboring countries in East Asia. In addition, the Japanese service account deficit has decreased since 2002. The current account surplus has been increasing because the increase in income account surplus is larger than the decrease in trade account surplus. This is a typical phenomenon which shows increasing a share of income account in the current account. It might diminish effects of exchange rate on current account through exports, imports, and trade account.

The accumulation of external net assets, which include foreign direct investments as well as international portfolio investments, is related with the decreases in domestic capital formation. Figure 3 shows the decreases in the share of domestic capital formation to GDP. It may be due to the fact that Japanese firms have been shifting their production to foreign countries which include East Asian countries. The increase in current account surplus is affected by the decrease in domestic capital formulation. Consumption by household and government has not decreased recently as shown in Figure 3.

Figure 4 shows movements in private sector's savings-investments and public sector's savings-investments, that is, fiscal deficits compared with the Japanese current account in terms of their ratio to GDP. The private sector's savings-investments as well as the fiscal deficit have tendency to decrease since 1995. Both of the tendencies have been offset to have no significant effects on Japanese current account in terms of trend.

Figure 5 shows decomposition of the private sector's savings-investments into private sector's savings and private sector's investments. The private sector's investments had decreased during 1990s but it has been increasing since 2002. On one hand, the private sector's savings had decreased since 1990s but it has turned to increase since 2005. Figure 6 shows decomposition of the fiscal deficit into public sector's incomes and public sector's expenditures. The increase in public sector's incomes decreased the fiscal deficits from 2002 to 2004 while decrease in public sector's expenditures contributed to the decrease in fiscal deficits from 2002 to 2006.

Regarding exchange rates of the Japanese yen, Figure 7 shows both nominal and real effective exchange rate of the Japanese yen while Figure 8 shows a nominal bilateral exchange rate of the US dollar in terms of the Japanese yen. Both the nominal and real effective exchange rates of the Japanese yen had an appreciating trend during a period from 1980 to 1995. Trends of the nominal and real effective exchange rates of the Japanese yen have changed since 1985. The nominal effective exchange rate of the Japanese yen has a horizontal trend with fluctuation while the real effective exchange rate has a depreciating trend. Such different trends between the nominal and real effective exchange rates were caused by long-run lower inflation and deflation in Japan. Also, the nominal bilateral exchange rate of the US dollar in terms of the Japanese yen had an appreciating trend before 1995 and has a horizontal trend after 1995.

3. Exchange rate adjustments of Japanese current account surplus

In this section, we investigate the adjustments of Japanese current account surplus, assuming that Japanese economy is a small open economy compared with rest of the world for simplification of the following VAR models³. For the purpose, VAR models are used to analyze the causality relationship between Japanese current account and its related economic variables and to examine how Japanese current account surplus has been adjusted. The Japanese domestic economic variables such as Japanese real interest rate and Japanese GDP growth rate as well as Japanese current account and real effective exchange rate of the Japanese yen are assumed to be endogenous variables while other economic variables are assumed to be exogenous.

Furthermore, we explicitly consider the representative factors of globalization into the estimation. Japanese firms have been increasing outward FDI to neighboring countries in East Asia to establish cross-boarder supply chains and production network. In addition, capital flows become more sensitive to international interest rate

³ See Pesaran and Shin (1998).

differentials and relative stock prices under the current globalization. We put such economic variables as the ratio of outward FDI to domestic investments and the ratio of income account to current account into the VAR models. Here, the ratio of FDI to domestic investment is used as a proxy for the global activities of Japanese firms and represents the production network between Japan and other East Asian countries. We will examine the relationship among Japanese exchange rate, FDI, income account and current account to see whether the increasing international activity and international financial transaction of Japanese firms play a key role for its current account determination.

We use two kinds of VAR models to investigate the effects of exchange rate on current account. One is the four-variable VAR model (Model J1) including the (logarithm of) real effective exchange rate of the Japanese yen, the ratio of Japanese current account in terms of GDP, the Japanese real interest rate, and the Japanese GDP growth rate. The other is the four-variable VAR model (Model J2) including the ratio of outward FDI in terms of domestic investments and the ratio of income account to current account as well as the (logarithm of) real effective exchange rate of the Japanese yen and the ratio of Japanese current account in terms of GDP.

Our analytical sample period covers from 1980Q1 to 2006Q4. The whole sample period is divided into two sub-sample periods (the first period from 1980Q1 to 1990Q4 and the second period from 1991Q1 to 2006Q4) in order to investigate possible changes in the elasticity of current account to exchange rate. Another reason for dividing the sample period into the two sub-sample periods is the different causes of current account between the two. The current account imbalance before 1990 mainly resulted from the fiscal deficits of the United States and the expansionary monetary policy in Japan, while the current account imbalance since 1991 has partly resulted from the high growth of productivity in the United States and the low aggregate demand in Japan.

Figure 9 shows impulse responses of the four variables (the logarithm of real effective exchange rate of the Japanese yen, the ratio of Japanese current account in terms of GDP, Japanese real interest rate, and Japanese GDP growth rate) to each of their shocks (generalized one standard deviation) with a band of two times standard errors in the case of Model J1 with two lags for each variable during the analytical period from 1980Q1 to 1990Q4. Figure on “Response of CURRENT_JAP to LN_REER” shows that the effect of the exchange rate on the current account is negative but insignificant. An appreciation of the Japanese yen reduces the current account surplus though insignificantly. On the other hand, Figure on “Response of LN_REER to CURRENT_JAP” shows that the effect of the current account on the exchange rate is

significantly positive. An increase in current account surplus significantly appreciates the Japanese yen.

Figure 10 shows the impulse responses of the four variables to each of their shocks in the case of Model J1 with two lags for each variable during the analytical period from 1991Q1 to 2006Q4. Figure on “Response of CURRENT_JAP to LN_REER” shows that the effect of the exchange rate on the current account is significantly negative while the reverse effect weakens the negative effect on current account after 2 years later. The effect of exchange rate on the current account becomes stronger in this period than the previous period. On the other hand, Figure on “Response of LN_REER to CURRENT_JAP” shows that the effect of the current account on the exchange rate is positive but insignificant for the first five years. The causality effect of the current account on the exchange rate becomes weaker in this period than the previous period. Thus, the effect of the exchange rate on the current account becomes stronger in the second period than in the first period though the effect of the current account on the exchange rate is weaker in the second period.

Figure 11a summarizes causalities among the economic variables during the first period from 1980Q1 to 1990Q4 in the case of Model J1. In the case of Model J1, it is indicated that the effect of the exchange rate on the current account is negative but insignificant during the first period. An appreciation of the Japanese yen reduces the current account surplus though insignificantly. On the other hand, the effect of the current account on the exchange rate is significantly positive.

On one hand, Figure 11b summarizes causalities among the economic variables during the first period from 1991Q1 to 2006Q4 in the case of Model J1. During the second period, the effect of the exchange rate on the current account is significantly negative. On the other hand, the effect of the current account on the exchange rate is positive but insignificant. The effect of the exchange rate on the current account becomes stronger in the second period than in the first period though the effect of the current account on the exchange rate is weaker in the second period.

Figure 12 shows impulse responses of the four variables to each of their shocks with a band of two times standard errors in the case of Model J2 with three lags for each variable during the analytical period from 1980Q1 to 1990Q4. Figure on “Response of CURRENT_JAP to LN_REER” shows time-variant effects of exchange rate on the current account though they are insignificant. The exchange rate has in turn negative effect, positive effect, and negative effect as time passes. On one hand, significantly positive effect of the current account on the exchange rate is shown Figure on “Response of LN_REER_JAP to CURRENT_JAP.”

Figures on “Response of FDI_INV_JAP to LN_REER_JAP”, “Response IA_CA_JAP of to FDI_INV_JAP”, and “Response of CURRENT_JAP to IA_CA_JAP” shows that all of the effects of the exchange rate on the FDI, of the FDI on income account, of the income account on the current account are significantly positive. It means that appreciation of the Japanese yen increases FDI, that increase in FDI increase income account, and that increase in income account increase the current account. This is an indirect effect of the exchange rate on the current account through FDI and income account. The indirect effect of the exchange rate on current account is positive in contrast with the negative direct effect of the exchange rate on the current account.

Figure 13 shows the impulse responses of the four variables to each of their shocks with a band of two times standard errors in the case of Model J2 with two lags for each variable during the analytical period from 1991Q1 to 2006Q4. Figure on “Response of CURRENT_JAP to LN_REER” shows that effects of exchange rate on the current account are significantly negative. Appreciation of the Japanese yen reduces current account surplus. On one hand, Figure on “Response of LN_REER_JAP to CURRENT_JAP” shows no evidence on significantly positive effect of the current account on the exchange rate. The negative effect of the exchange rate on the current account becomes stronger in the second period than in the first period though the effect of the current account on the exchange rate is weaker in the second period in the case model J2 as well as model J1.

Figure on “Response of FDI_INV_JAP to LN_REER_JAP” shows no significant effects of the exchange rate on the FDI while Figures on “Response IA_CA_JAP of to FDI_INV_JAP” and “Response of CURRENT_JAP to IA_CA_JAP” shows that both of the effects of the FDI on the income account and those of the income account on the current account are significantly positive. An appreciation of the Japanese yen has no longer increased the FDI, but the increase in the FDI increases the income account and increases in the income account increase the current account since 1990. The insignificant effect of the exchange rate on the income account and its significant effect on the current account indicate that exchange rate has an influence not on income account but on trade account.

Figure 14a summarizes causalities among the economic variables during the first period from 1980Q1 to 1990Q4 in the case of Model J2. All of the effects of the exchange rate on the FDI, of the FDI on income account, of the income account on the current account are significantly positive. The appreciation of the Japanese yen increases FDI, that increase in FDI increase income account, and that increase in income account

increase the current account.

Figure 14b summarizes causalities among the economic variables during the first period from 1991Q1 to 2006Q4 in the case of Model J2. The negative effect of the exchange rate on the current account becomes stronger in the second period than in the first period though the effect of the current account on the exchange rate is weaker in the second period in the case of Model J2 as well as in the case of Model J1. The exchange rate had no significant effects on the FDI while both of the effects of the FDI on the income account and those of the income account on the current account are significantly positive.

4. Adjustments of East Asian current account surplus

The production networks due to Japan's FDI in East Asia might change trade patterns, the reactions of international trade to exchange rates, and the composition of the current account of other East Asian countries as well as Japan. The changes might make any structural changes in the responses of current account imbalances to exchange rates not only for Japan but also for other East Asian countries and East Asia as a whole. In this section, we investigate the effect of exchange rate on current account for both East Asia including Japan as well as that excluding Japan for the purpose of comparing with the Japan only.

We assume that the East Asian economy is a small open economy compared with rest of the world for simplification of the following VAR models. The regional economic variables in East Asia⁴ such as East Asian real interest rate and East Asian GDP growth rate as well as East Asian current account and real effective exchange rate of weighted average of East Asian currencies are endogenous variables.⁵

Regarding East Asia excluding Japan, we use two kinds of VAR model to estimate parameters of the VAR models and then to analyze impulse response of the variables to each of their shocks given the estimated VAR models in order to investigate effects of exchange rate of current account and so on. One of the two VAR models is a four-variable VAR model (Model EA1) which includes a real effective exchange rate of weighted average of East Asian currencies, a ratio of East Asian current account in terms of GDP, East Asian real interest rate, and East Asian GDP growth rate. The other one is a four-variable VAR model (Model EA2) which includes a ratio of inward FDI in

⁴ Here, East Asia includes eight countries (Japan, China, Korea, Singapore, Malaysia, Indonesia, the Philippines, and Thailand).

⁵ See Appendix for aggregation of the economic variables for East Asia.

terms of domestic investments and a ratio of income account in terms of current account in East Asia as well as the real effective exchange rate of weighted average of East Asian currencies and the ratio of East Asian current account in terms of GDP.

Regarding East Asia including Japan, one VAR model is used to estimate parameters of the VAR models and then to analyze impulse response of the variables to each of their shocks given the estimated VAR models in order to investigate effects of exchange rate of current account and so on. The VAR model is a four-variable VAR model (Model EA3) which includes the real effective exchange rate of weighted average of East Asian currencies, a ratio of East Asian current account in terms of GDP, East Asian real interest rate, and East Asian GDP growth rate. Model EA3 corresponds to Model EA1 in the case of East Asia excluding Japan. On the other hand, we do not set up any VAR model that corresponds to Model EA2 which includes FDI variables because it seems that outward FDI from Japan and inward FDI to other East Asian countries are offset in the case of East Asia including Japan.

An analytical sample period for East Asia covers a period from 1991Q1 to 2006Q4 due to data constraint, that is, lack of Chinese CPI data. Unfortunately, it is possible to compare East Asian case with Japanese case only in the period from 1991Q1 to 2006Q4.

Figure 15 shows impulse responses of the four variables (logarithm of real exchange rate of the AMU in terms of a currency basket of US dollar and the euro, a ratio of East Asian current account in terms of GDP, East Asian real interest rate, and East Asian GDP growth rate) to each of their shocks (generalized one standard deviation) with a band of two times standard errors in the case of Model EA1 with two lags for each variable during the analytical period from 1991Q1 to 2006Q4. Figure on “Response of CURRENT_ASIA to LN_RE_AMU” shows that the effect of the exchange rate on the current account is significantly negative. It means that appreciation of the weighted average of East Asian currencies reduces the current account surplus. On the other hand, Figure on “Response of LN_RE_AMU to CURRENT_ASIA” shows that the effect of the current account on the exchange rate is significantly negative. It means that increase in current account surplus significantly depreciates the weighted average of East Asian currencies.

Figure 16 shows the impulse responses of the four variables to each of their shocks with a band of two times standard errors in the case of Model EA2 (East Asia excluding Japan) with three lags for each variable during the analytical period from 1991Q1 to 2006Q4. Figure on “Response of CURRENT_ASIA to LN_RE_AMU” shows significant negative effects of real exchange rate of weighted average of East Asian currencies on the East Asian current account. On the other hand, the significantly positive effect of

the East Asian current account on the exchange rate of weighted average of East Asian currencies is shown Figure on “Response of LN_RE_AMU to CURRENT_ASIA.”

Figure on “Response of FDI_INV_ASIA to LN_RE_AMU” shows significantly negative effects of the exchange rate of weighted average of East Asian currencies on the inward FDI to East Asia. On the other hand, Figures on “Response IA_CA_ASIA of to FDI_INV_ASIA” and “Response of CURRENT_ASIA to IA_CA_ASIA” shows that both of the effects of the inward FDI to East Asia on the East Asian income account and of the East Asian income account on the East Asian current account are insignificant. It means that appreciation of the weighted average of East Asian currencies significantly decreases inward FDI to East Asia.

Figure 17 shows the impulse responses of the four variables (logarithm of real exchange rate of the AMU in terms of a currency basket of US dollar and the euro, a ratio of East Asian current account in terms of GDP, East Asian real interest rate, and East Asian GDP growth rate) to each of their shocks with a band of two times standard errors in the case of Model EA3 (East Asia including Japan) with two lags for each variable during the analytical period from 1991Q1 to 2006Q4. Figure on “Response of CURRENT_GDP_ASIA to LOG_AMU_R” shows that the effect of the exchange rate on the current account is significantly negative. An appreciation of the weighted average of East Asian currencies reduces the East Asian current account surplus. On the other hand, Figure on “Response of LOG_AMU_R to CURRENT_GDP_ASIA” shows that the effect of the East Asian current account on the exchange rate of weighted average of East Asian currencies is significantly negative. The increase in current account surplus significantly depreciates the weighted average of East Asian currencies.

Figure 18 summarizes causalities among the economic variables during the period from 1991Q1 to 2006Q4 in the case of Model EA1 for East Asia excluding Japan. It is indicated that the effect of the exchange rate on the current account is significantly negative during the period. On one hand, the effect of the current account on the exchange rate is significantly negative.

Figure 19 summarizes causalities among the economic variables during the period from 1991Q1 to 2006Q4 in the case of Model EA2 for East Asia excluding Japan. In the case of Model EA2, we have significant negative effects of the exchange rate of weighted average of East Asian currencies on the East Asian current account while the East Asian current account has a significantly positive effect on the exchange rate of weighted average of East Asian currencies. In addition, the exchange rate of weighted average of East Asian currencies had significantly negative effects on the inward FDI to East Asia. On one hand, both of the effects of the inward FDI to East Asia on the East

Asian income account and of the East Asian income account on the East Asian current account are insignificant.

Figure 20 summarizes causalities among the economic variables during the period from 1991Q1 to 2006Q4 in the case of Model EA3 for East Asia including Japan during the period from 1991Q1 to 2006Q4. It is shown that the exchange rate has significantly negative effects on the current account while the effect of the East Asian current account on the exchange rate of weighted average of East Asian currencies is significantly negative.

5. Comparison of exchange rate adjustments between Japan and East Asia

In this section, we compare the results of the impulse responses of current accounts to exchange rates in the previous two sections among Japan only, East Asia excluding Japan, and East Asia including Japan. As for Japan, we investigate how much appreciation of the Japanese yen is necessary to reduce the Japanese current account surplus from a current level (4% of GDP) to its half level (2% of GDP). On one hand, as for East Asia, we investigate how much appreciation of East Asian currencies is necessary to reduce the current account surplus of East Asia from a current level (3% of GDP) to its 1% of GDP by 2% points that is the same change (% points) as Japanese case.

As for exchange rate adjustment to the current account surplus for only Japan during the period from 1991Q1 to 2006Q4, Model J1 shows that an exogenous 1% appreciation of the Japanese yen yields 2.56% appreciation of the Japanese yen and 0.23% point decrease in the Japanese current account surplus in 50 quarters (12 and half years). It means that 0.23% point of decrease in the Japanese current account surplus needs 2.56% appreciation of the Japanese yen during 50 quarters (12 and half years). We can calculate that a 22.3% appreciation of the Japanese yen during 12 and half years is needed in order to reduce the Japanese current account surplus from the current level (4%) to its half level (2%) by 2% point.

As for exchange rate adjustment to the current account surplus for only Japan during the period from 1991Q1 to 2006Q4, Model J2 shows that an exogenous 1% appreciation of the Japanese yen yields 10.48% appreciation of the Japanese yen and 0.73% point decrease in the Japanese current account surplus in 50 quarters (12 and half years). It means that 0.73% point of decrease in the Japanese current account surplus needs 10.48% appreciation of the Japanese yen during 50 quarters (12 and half years). We can calculate that a 28.7% appreciation of the Japanese yen during 12 and

half years is needed in order to reduce the Japanese current account surplus from the current level (4%) to its half level (2%) by 2% point.

As for exchange rate adjustment to the current account surplus for East Asia excluding Japan during the period from 1991Q1 to 2006Q4, Model EA1 shows that an exogenous 1% appreciation of the weighted average of East Asian currencies yields 18.52% appreciation of the weighted average of East Asian currencies and 1.53% point decrease in the East Asian current account surplus in 50 quarters (12 and half years). It means that 1.53% point of decrease in the East Asian current account surplus needs 18.52% appreciation of the weighted average of East Asian currencies during 50 quarters (12 and half years). We can calculate that a 24.2% appreciation of the weighted average of East Asian currencies during 12 and half years is needed in order to reduce the East Asian current account surplus from the current level (3%) to 1% by 2% point that is the same change (% points) as Japanese case.

As for exchange rate adjustment to the current account surplus for East Asia excluding Japan during the period from 1991Q1 to 2006Q4, Model EA2 shows that an exogenous 1% appreciation of the weighted average of East Asian currencies yields 31.4% appreciation of the weighted average of East Asian currencies and 3.61% point decrease in the East Asian current account surplus in 50 quarters (12 and half years). It means that 3.61% point of decrease in the East Asian current account surplus needs 31.4% appreciation of the weighted average of East Asian currencies during 50 quarters (12 and half years). We can calculate that a 17.4% appreciation of the Japanese yen during 12 and half years is needed in order to reduce the Japanese current account surplus from the current level (3%) to 1% by the 2% point.

As for exchange rate adjustment to the current account surplus for East Asia including Japan during the period from 1991Q1 to 2006Q4, Model EA3 shows that an exogenous 1% appreciation of the weighted average of East Asian currencies yields 6.79% appreciation of the weighted average of East Asian currencies and 0.87% point decrease in the East Asian current account surplus in 50 quarters (12 and half years). It means that 0.87% point of decrease in the East Asian current account surplus needs 6.79% appreciation of the weighted average of East Asian currencies during 50 quarters (12 and half years). We can calculate that a 15.6% appreciation of the weighted average of East Asian currencies during 12 and half years is needed in order to reduce the East Asian current account surplus from the current level (3%) to 1% by the 2% point.

The comparison of the exchange rate adjustments to current account imbalances tells us that 22% to 29% of appreciation of the Japanese yen during 12 and half years is needed in order to reduce the Japanese current account surplus from the current level

(4%) to its half level (2%) by 2% point while 17% to 24% of appreciation of the weighted average of East Asian currencies excluding the Japanese yen during 12 and half years is needed in order to reduce the current account surplus of East Asia excluding Japan from the current level (3%) to 1% by the 2% point that is the same change (% points) as Japanese case. It is smaller appreciation of East Asian currencies that is needed for the same % points of reduction in the current account in terms of GDP than that of the Japanese yen only.

Moreover, 16% of appreciation of the weighted average of East Asian currencies including the Japanese yen during 12 and half years is needed in order to reduce the current account surplus of East Asia including Japan from the current level (3%) to 1% by the 2% point. At the time, much smaller appreciation of the weighted average of East Asian currencies is needed to reduce the East Asian current account surplus as a whole if East Asian countries go together to appreciate the currencies. Coordinated exchange rate policies among the East Asian countries would reduce a burden of appreciation of its home currency for each of the countries compared with the cases of appreciation of Japanese yen only and of other East Asian currencies only.

6. Conclusion

This paper investigated how much realignment of currencies we need for adjustments to the current account imbalances, assuming that only exchange rates play the role of adjustment and leaving the external economic factors such as the economic variables of the United States unaltered. We used the four-variable VAR models to compare exchange rate adjustments to current account imbalances among Japan, the East Asia excluding Japan, and East Asia including Japan. Moreover, we focus on the economic integration in East Asia through the increases in FDI and the accompanying increase in income account to investigate the exchange rate adjustments of Japanese and East Asian current account surpluses. By doing so, we considered the effects of the establishing production networks in East Asia by Japanese FDI to other East Asian countries and increasing intra-regional trade among East Asian countries under the globalization.

The analytical results show that a large appreciation of the Japanese yen is necessary to significantly decrease the current account surplus of Japan, holding the economic conditions of the United States unchanged, given that governments use no macroeconomic policies to adjust current account imbalances. The recent increases in Japanese current account surplus have been caused by the increases in its income

account surplus rather than the trade account surplus. We show that the Japanese economy has a mechanism that increases in the Japanese outward FDI/domestic investment increase the Japanese current account surplus through increases in the income account surplus. Especially since 1990s, the FDI has a tendency to increase independently of the exchange rate movement of the Japanese yen. Moreover, the findings of both the insignificant effect of the exchange rate on the income account and its significant effect on the current account indicate that exchange rate has an influence not on income account but on trade account. As the result, the Japanese economy has an increasing structural part of the Japanese current account which does not respond to the exchange rate movement. It implies there may be a less room for the exchange rate to adjust the Japanese current account imbalances.

This paper also shows the evidence that a smaller appreciation of East Asian currencies as a whole is needed for the same % points of the reduction in the current account in terms of GDP than that of the Japanese yen only and that of the other East Asian currencies only. If East Asian currencies as a whole adjusted to the current account imbalances, the required appreciation of the currencies would be smaller than the case where only Japanese yen were responsible for adjusting the imbalances. The findings justify a policy implication for the monetary authorities of East Asian countries. It is necessary for them to coordinate exchange rate policies among the East Asian countries in order to enhance the effectiveness of the East Asian exchange rate adjustments to the global current account imbalances.

Moreover, the comparison the effects of the GDP growth rate on the current account between the first and second periods shows that the effects have changed from no effects during the first period to insignificantly negative effects in the first year during the second period. Recently it indicates that macroeconomic policies may have some effects on the current account via increasing Japanese aggregate demands although it is not statistically significant. It is true that increase in Japanese aggregate demands such as consumptions and investments can contribute to decrease in the Japanese current account surplus. However, it is a problem that it is not secure that macroeconomic policy can stimulate the aggregate demands in the current situation of Japanese economy.

The current wide-spreading subprime mortgage problem seems to have an effect on the exchange rate adjustments to the US current account deficit due to the reductions of private residential investment and consumption in the United States. If the changes in the aggregate demand make adjustments to the current account of the United States and, in turn, depreciate the US dollar against the Japanese yen and other

East Asian currencies, the required exchange rate changes should be smaller than our empirical results resulting from the exogenous exchange rate changes (“Soft-landing scenario”). However, the solution of the global imbalance might be delayed if the reduction of the consumption in the United States and the appreciation of the Japanese yen and other East Asian currencies cool down the Japanese and other East Asian economies. Accordingly, further coordination of macroeconomic policy should be desired among the United States, Japan, and other East Asian countries to avoid the hard-landing scenario.

Appendix: Data

Regarding data for the analysis, a weighted average of exchange rate of East Asian currencies in terms of a currency basket of the US dollar and the euro as major trading partners for East Asia is used as an exchange rate while a sum of current accounts of East Asian countries against rest of the world that is normalized by a sum of GDP of East Asian countries is used as a current account. Data on Asian Monetary Unit (AMU)⁶ is available as a weighted average of exchange rate of East Asian currencies. Data on AMU is used for exchange rate of East Asian currencies including the Japanese yen. On one hand, data on AMU excluding the Japanese yen is calculated by the authors to use for exchanger rate of East Asian currencies excluding the Japanese yen. The real exchange rate of a currency basket of the US dollar and the euro in terms of the AMU is used for the analysis. Shares on the US dollar and the euro are based on trade (exports + imports) share of East Asia with the United States and the euro area (65%:35%). On one hand, weights on composite East Asian currencies for the weighted average of East Asian currencies are based on intraregional trade shares and shares of GDP measured at the purchasing power parity (PPP). Most of data are available in IMF, *International Financial Statistics*. Chinese investments in plants and equipments and inventory investments are available in *Datastream*. As for Chinese internal FDI data, quarterly data are made from its annual data in IMF, *Balance of Payments Statistics* using an interpolation method. Chinese CPI is available in data in IMF, *International Statistical Finance* that is calculated (December 2000=100) based on rate of changes in CPI that are obtained from National Bureau of Statistics, *China Statistical Yearbook*. A weight on each country is its relevant share of GDP in terms of the US dollar when we calculate East Asian real interest rate and East Asian real GDP growth rate.

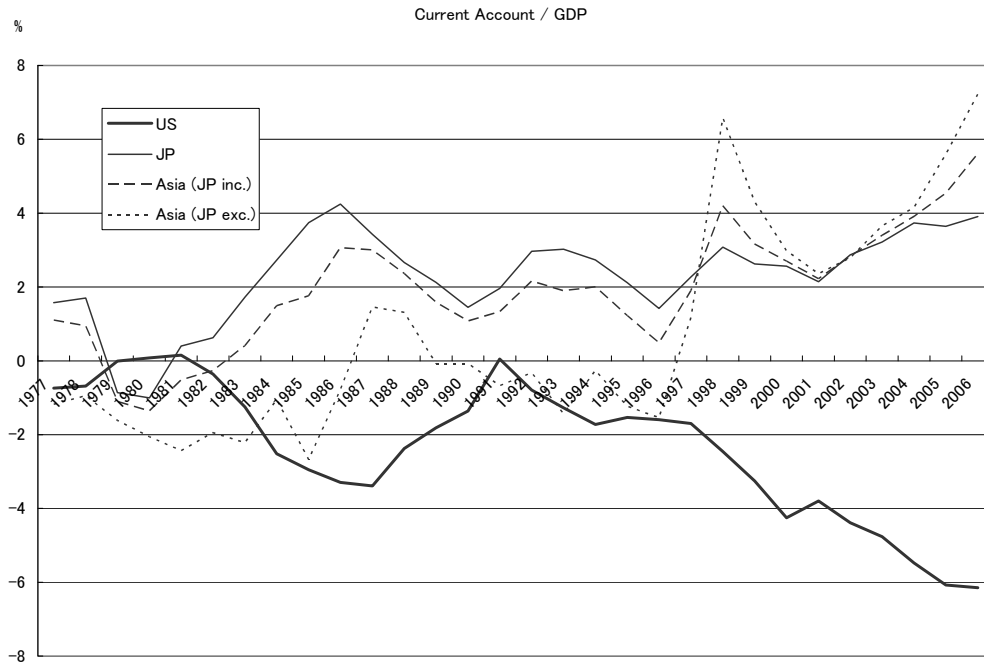
⁶ See a website of the AMU (<http://www.rieti.go.jp/users/amu/en/index.html>).

References

- Ahmed, S. and J. H. Rogers, 1995, "Government budget deficits and trade deficits: Are present value constraints sustained in long-term data?" *Journal of Monetary Economics*, 36, 351-374.
- Bernanke, B. S., 2005, "The Global Saving Glut and the U.S. Current Account Deficit," Remarks at the Sandridge Lecture, Virginia Association of Economics, Richmond, Virginia, March 10, 2005.
- Campa, J. and L. Goldberg, 2002, "Exchange rate pass-through into import prices: A macro or micro phenomenon?" *NBER Working Paper*, no. 8934.
- Dixit, A., 1989, "Hysteresis, import penetration, and exchange rate pass-through," *Quarterly Journal of Economics*, 104, 202-228.
- Kim, S., and N. Roubini, 2003, "Twin deficit or twin divergence?: Fiscal policy, current account, and real exchange rate in US," New York University.
- Mann, C. L., 2002. "Perspectives on the U.S. current account deficit and sustainability," *Journal of Economic Perspectives*, 16, 131-152.
- Marston, R.C., 1990, "Pricing to market in Japanese manufacturing," *Journal of International Economics*, 29, 217-236.
- Matsubayashi, Y., 2005, "Are US current account deficits unsustainable? Testing for the private and government intertemporal budget constraints," *Japan and the World Economy*, 17, 223-237.
- Matsubayashi, Y., 2006, "Structural and cyclical movements of the current account in Japan: An alternative measure," *Japan and the World Economy*, 18, 545-567.
- Obstfeld, M. and K. Rogoff, 2007, "The unsustainable U.S. current account position revisited," R. H. Clarida, ed. *G7 Current Account Imbalances: Sustainability and Adjustment*, University of Chicago Press, 339-366.
- Ogawa, E. and T. Kudo, 2007a. "Asymmetric responses of East Asian currencies to the US dollar depreciation for reducing the US current account deficits," *Journal of Asian Economics*, 18, 175-194.
- Ogawa, E. and T. Kudo, 2007b, "Possible depreciation of the US dollar for unsustainable current account deficit in the United States," *CESifo Forum*, 4, 24-30.
- Ohtani, A., S. Shiratsuka, and T. Shirota, 2003, "Decreasing pass-through of exchange rates: Studies on Japanese import prices," Bank of Japan, *Kinyu-kenkyu*, vo.22, no. 3, 59-90. (in Japanese)

- Parsons, C.R. and K. Sato, 2006, "Exchange rate pass-through and currency invoicing: Implications for monetary integration in East Asia," *The World Economy*, 29, 1759-1788.
- Pesaran, M.H. and Y. Shin, 1998. "Impulse response analysis in linear multivariate models," *Economic Letters*, 58, 17-29.

Figure 1: Current Account/GDP of US, Japan, and East Asia



Data: IMF, *International Financial Statistics*

Figure 2: Japanese Current Account and its Composition

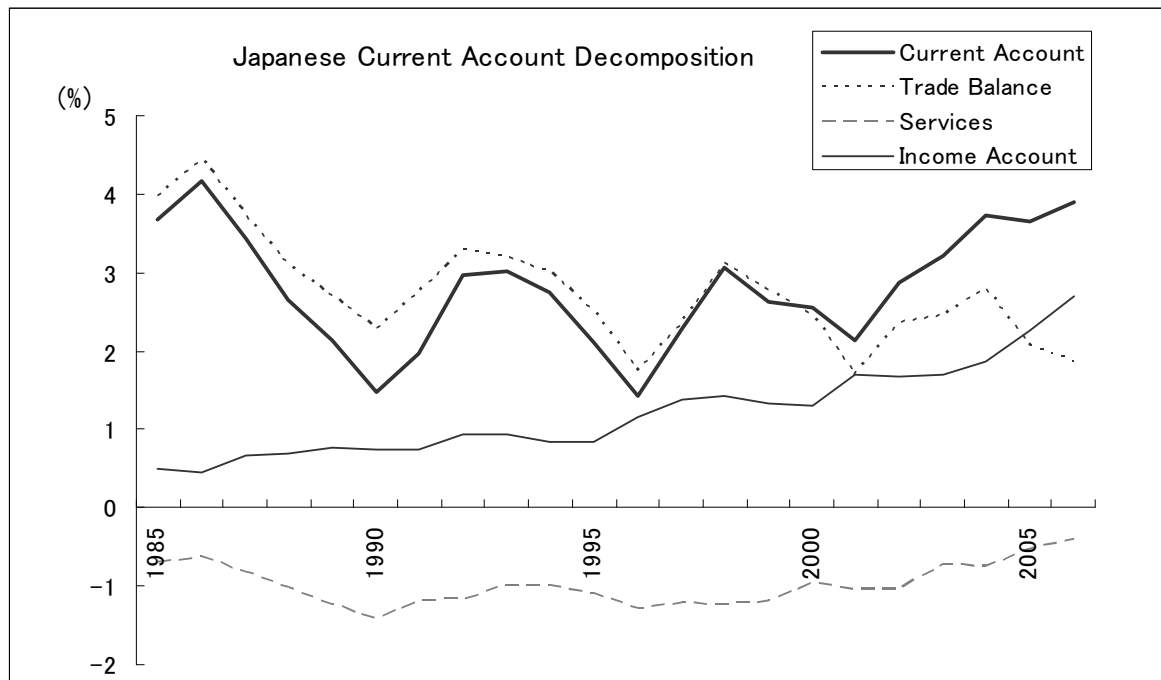


Figure 3: Japanese Demand Decomposition

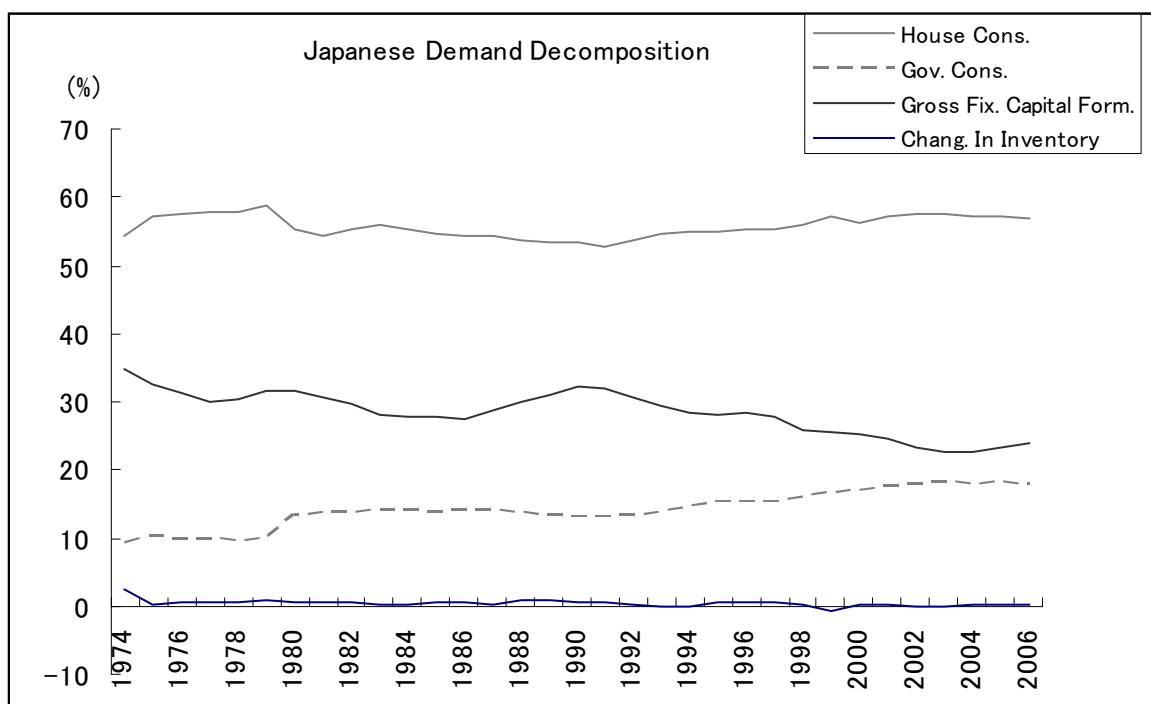


Figure 4: Private Savings-Investments, Fiscal Deficit, and Net Export in Japan

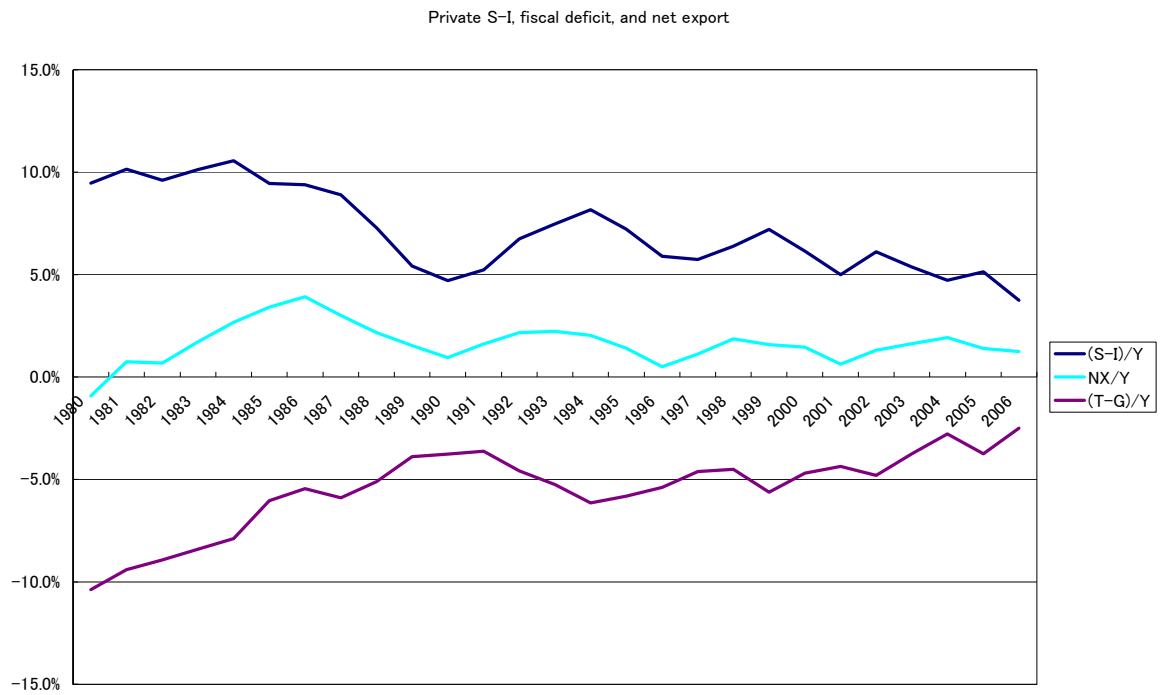


Figure 5: Decomposition of Private Savings-Investments in Japan

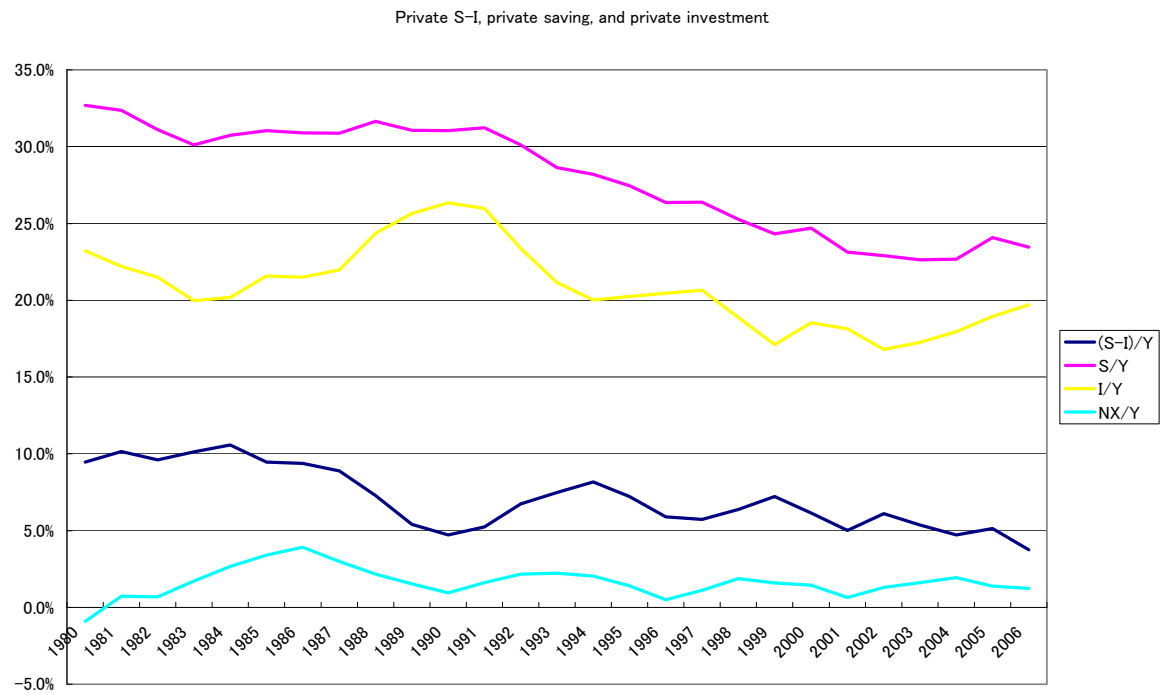


Figure 6: Decomposition of Fiscal Deficit in Japan

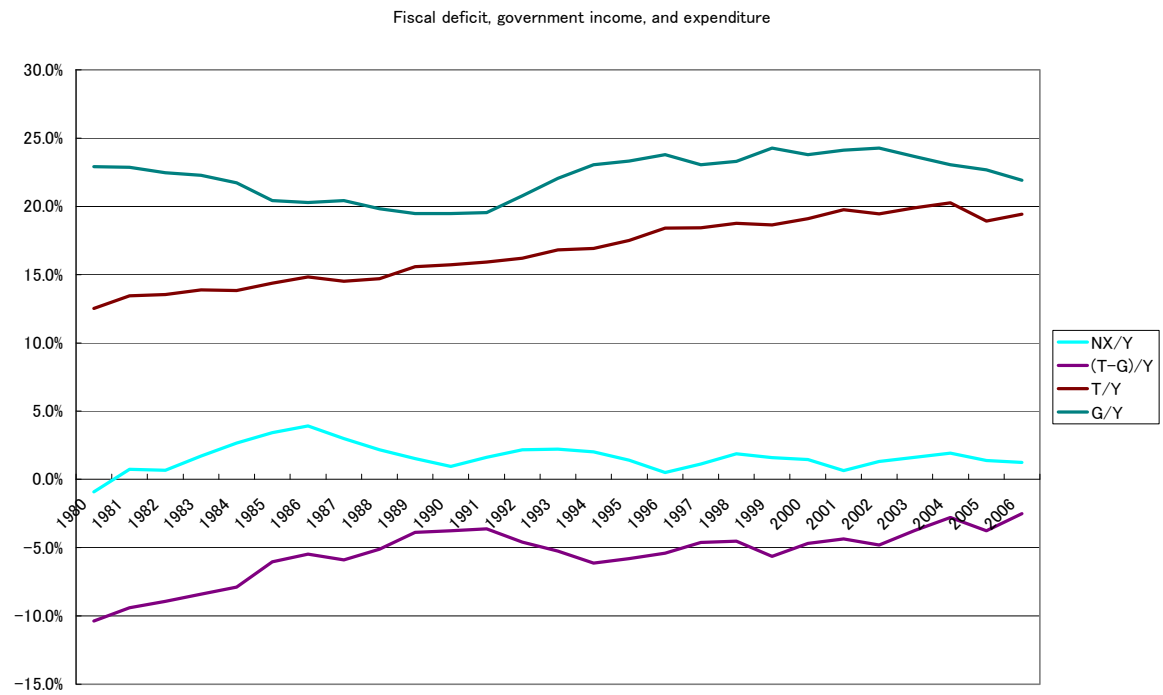
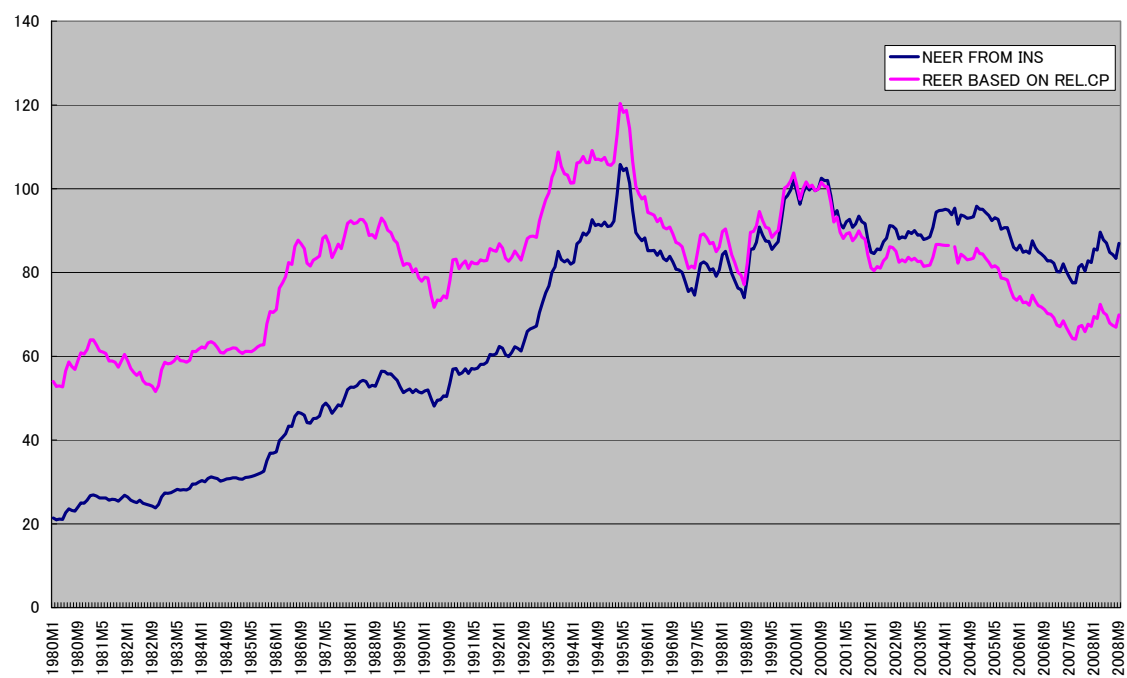
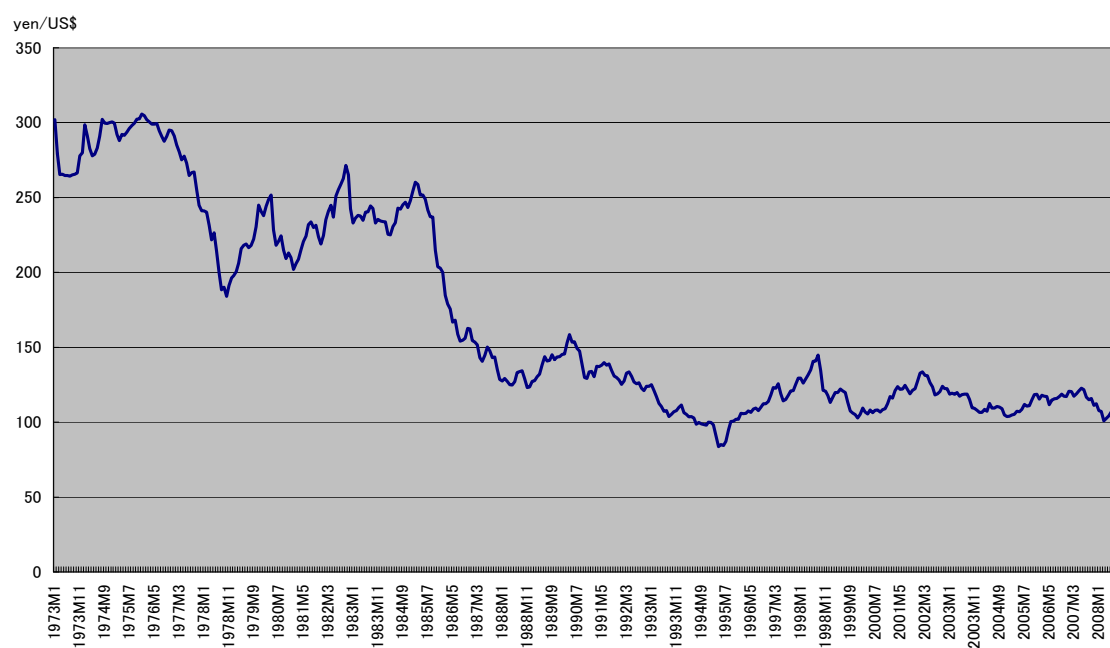


Figure 7: Nominal and Real Effective Exchange Rate of the Japanese yen



Data: IMF, *International Financial Statistics*

Figure 8: Exchange rate of the US dollar in terms of the Japanese yen



Data: IMF, *International Financial Statistics*

Figure 9: Impulse Responses to the shocks in Japan, Model J1, 1980Q1-1990Q4

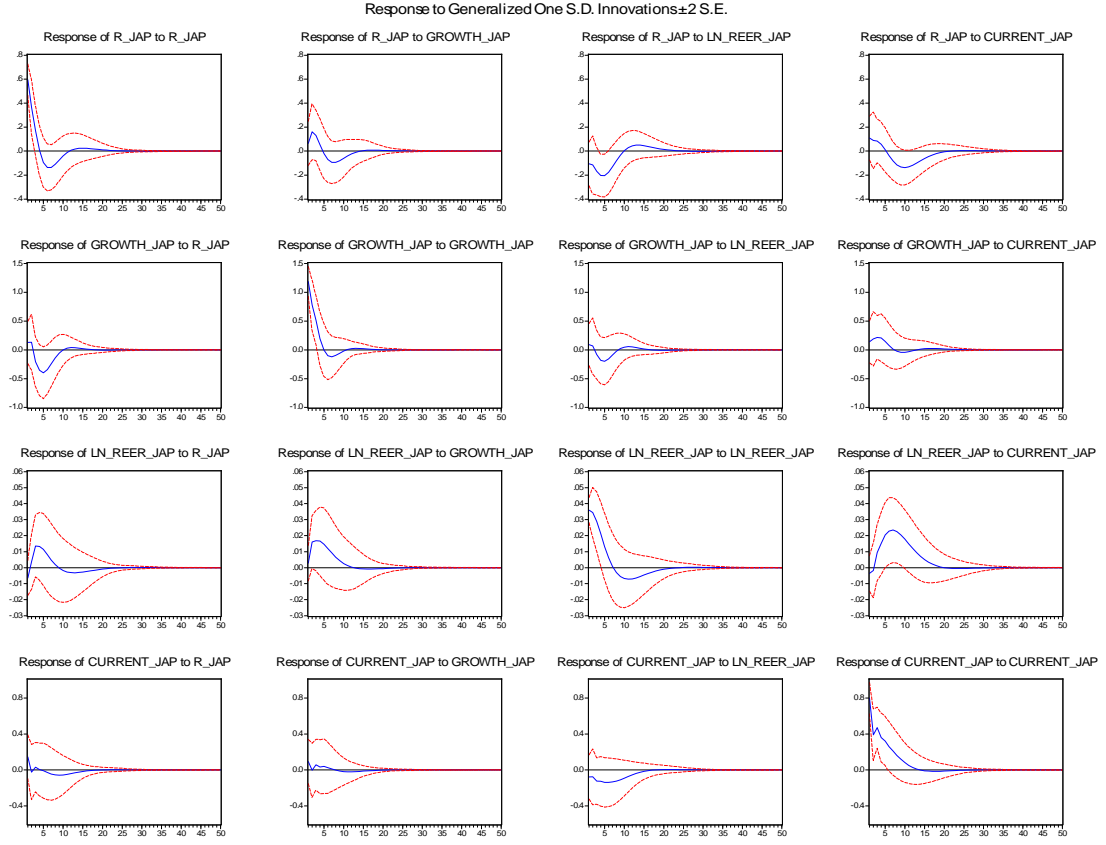


Figure 10: Impulse Responses to the shocks in Japan, Model J1, 1991Q1-2006Q4

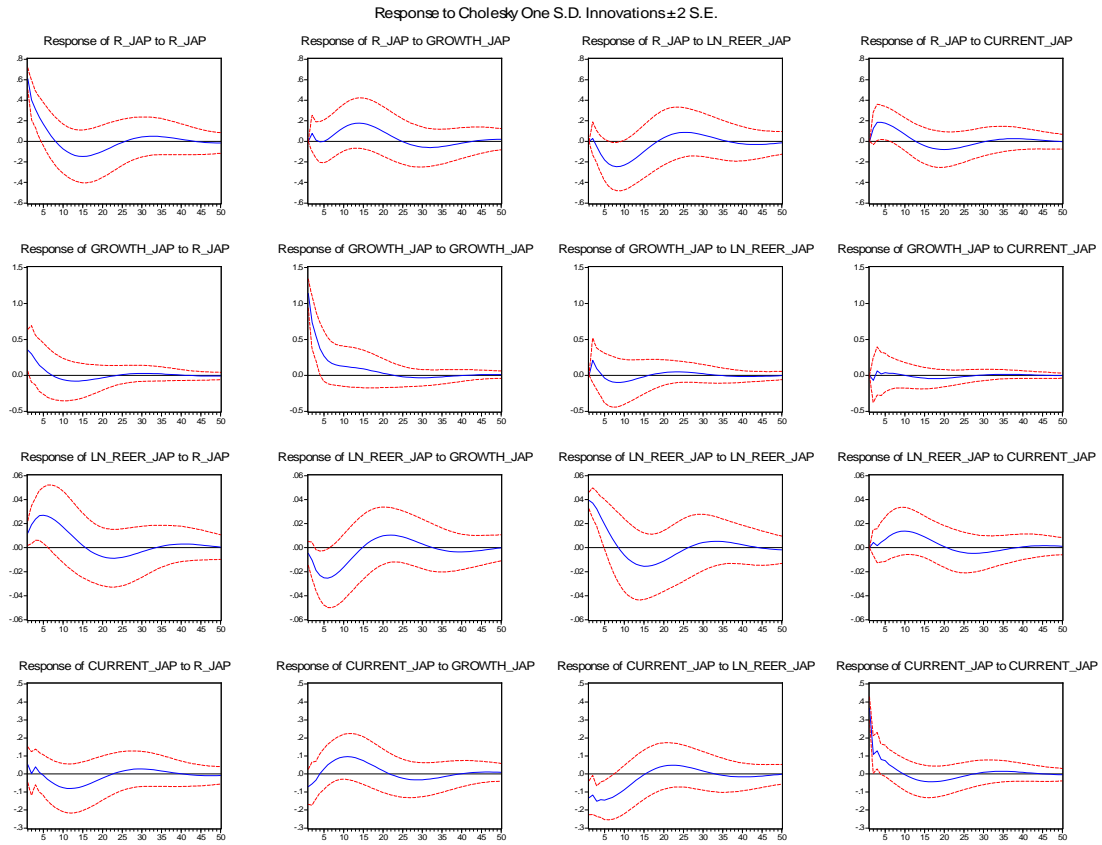


Figure 11a: Causalities among the economic variables in Model J1
1980Q1-1990Q4

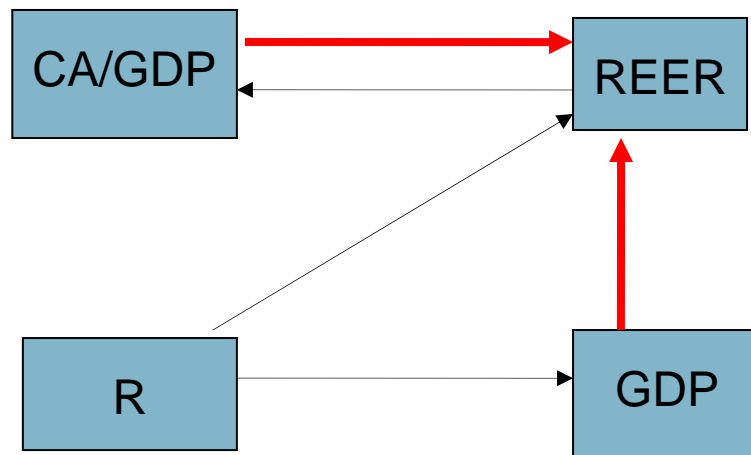


Figure 11b: Causalities among the economic variables in Model J1
1991Q1-2006Q4

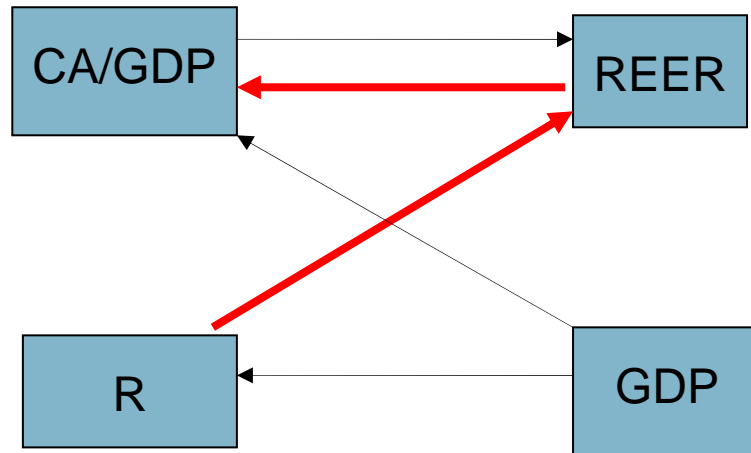


Figure 12: Impulse Responses to the shocks in Japan, Model J2, 1980Q1-1990Q4

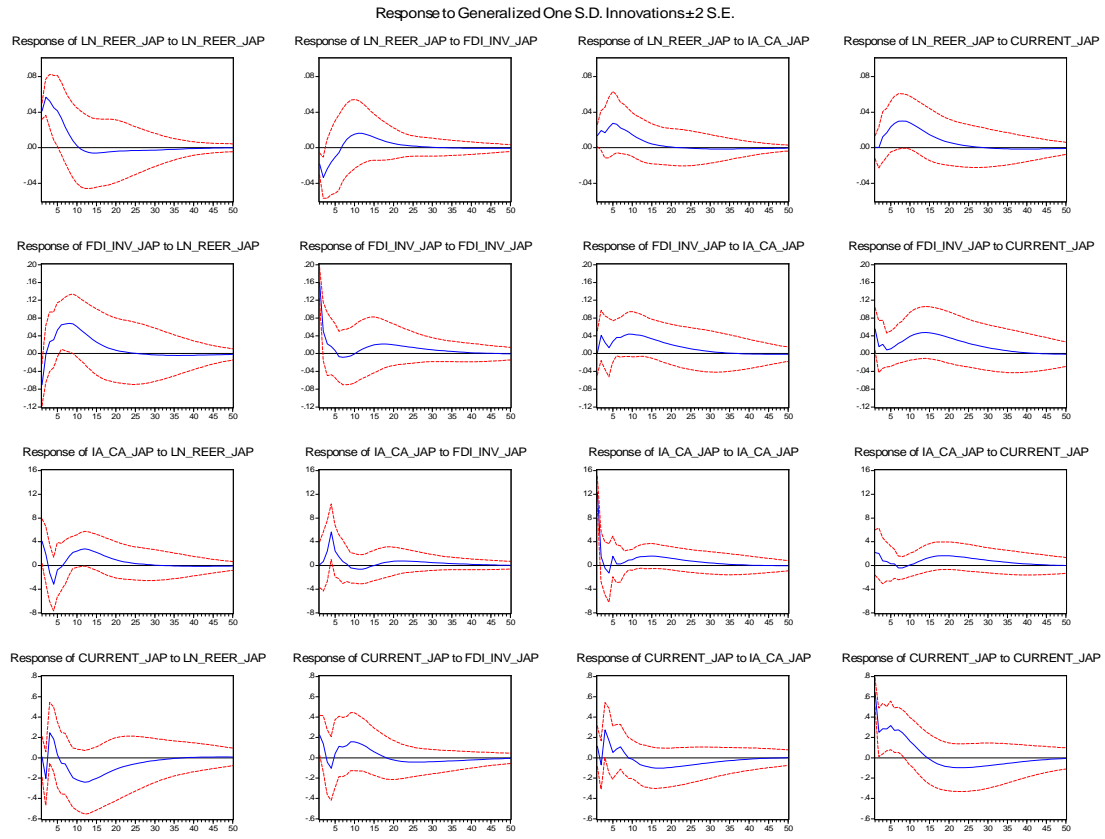


Figure 13: Impulse Responses to the shocks in Japan, Model J2, 1991Q1-2006Q4

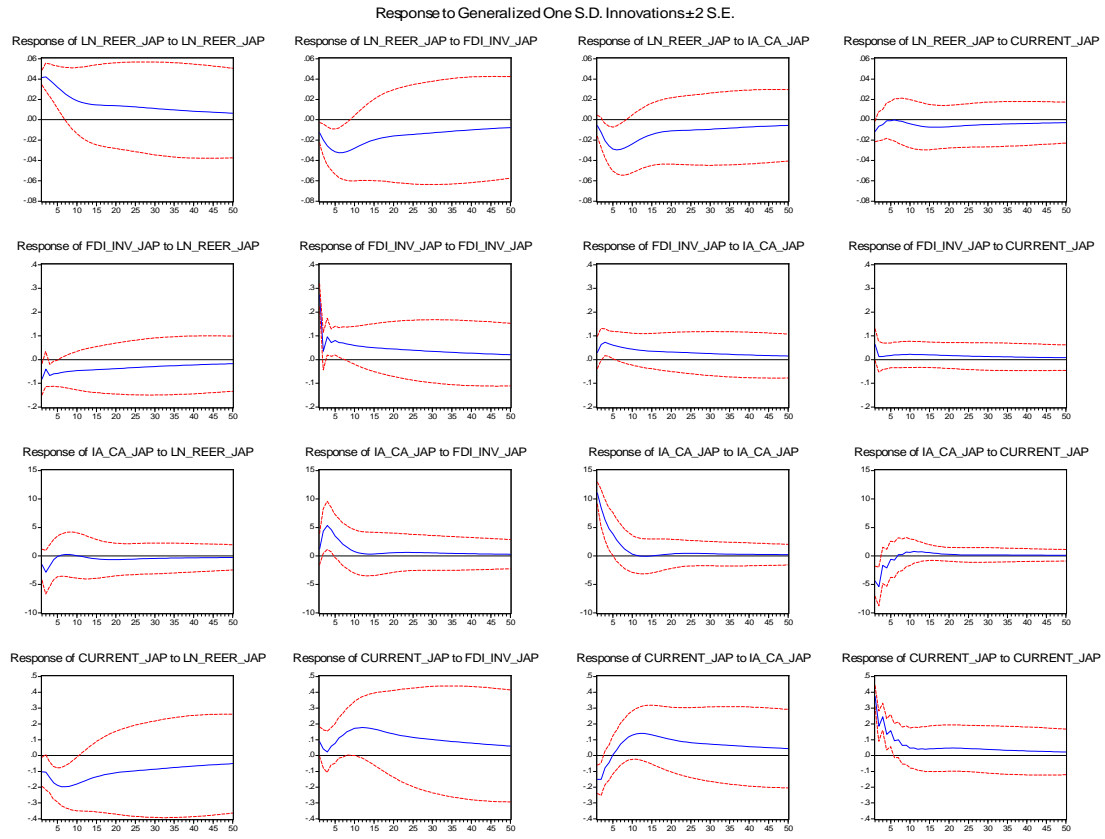


Figure 14a: Causalities among the economic variables in Model J2
1980Q1-1990Q4

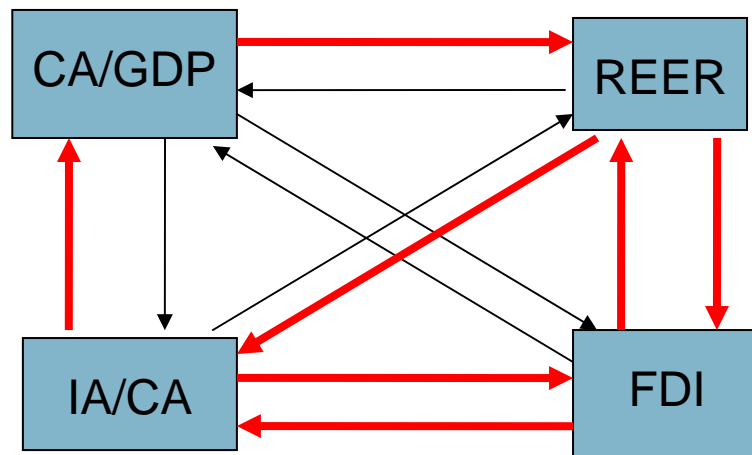


Figure 14b: Causalities among the economic variables in Model J2
1991Q1-2006Q4

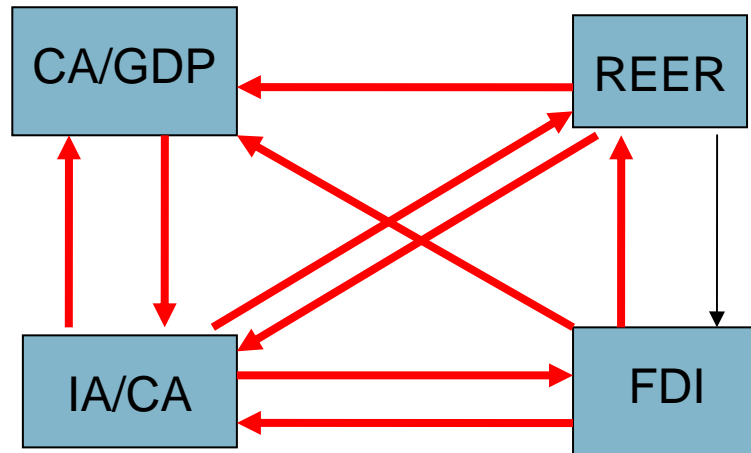


Figure 15: Impulse Responses to the shocks in East Asia excluding Japan, Model EA1,
1991Q1-2006Q4

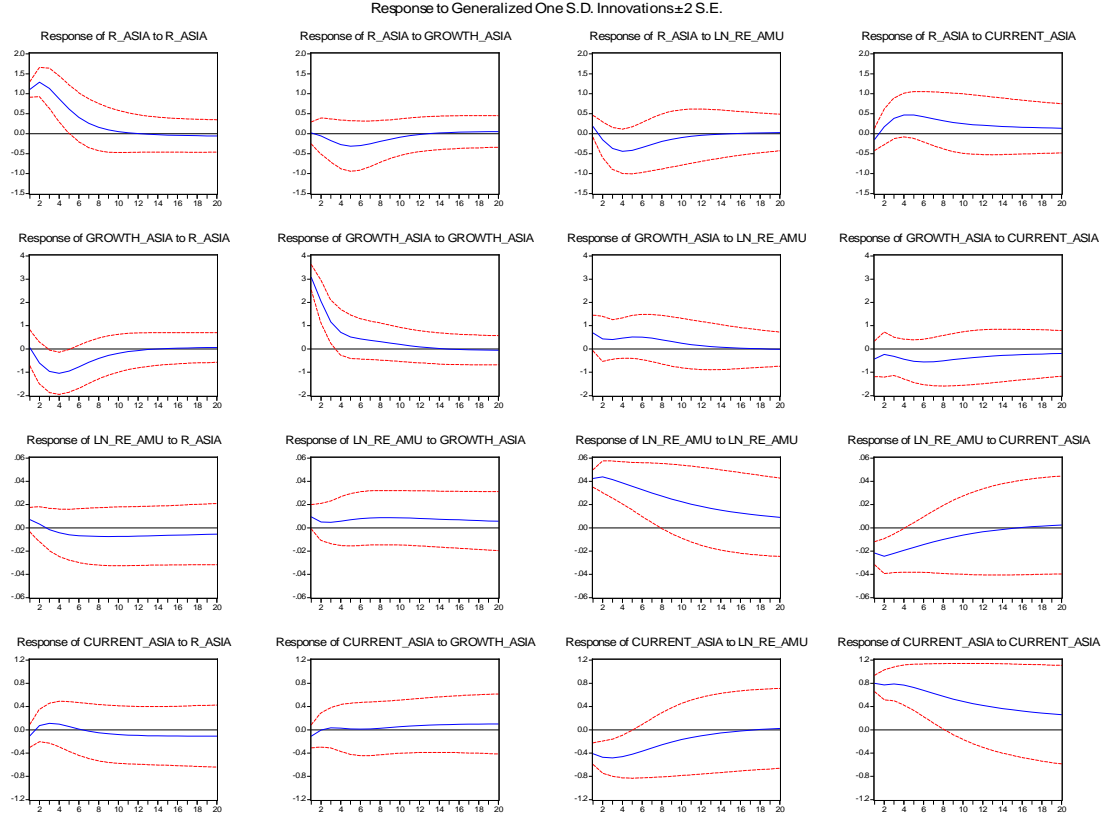


Figure 16: Impulse Responses to the shocks in East Asia excluding Japan, Model EA2,
1991Q1-2006Q4

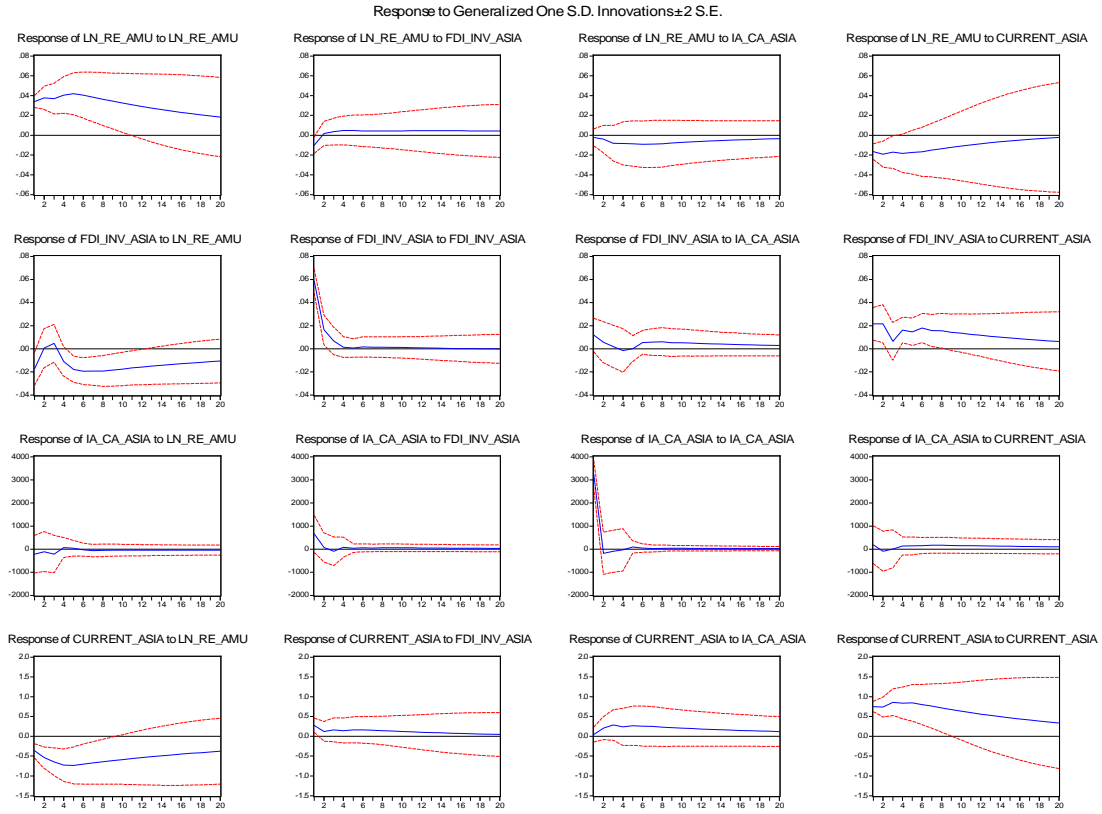


Figure 17: Impulse Responses to the shocks in East Asia including Japan, Model EA3,
1991Q1-2006Q4

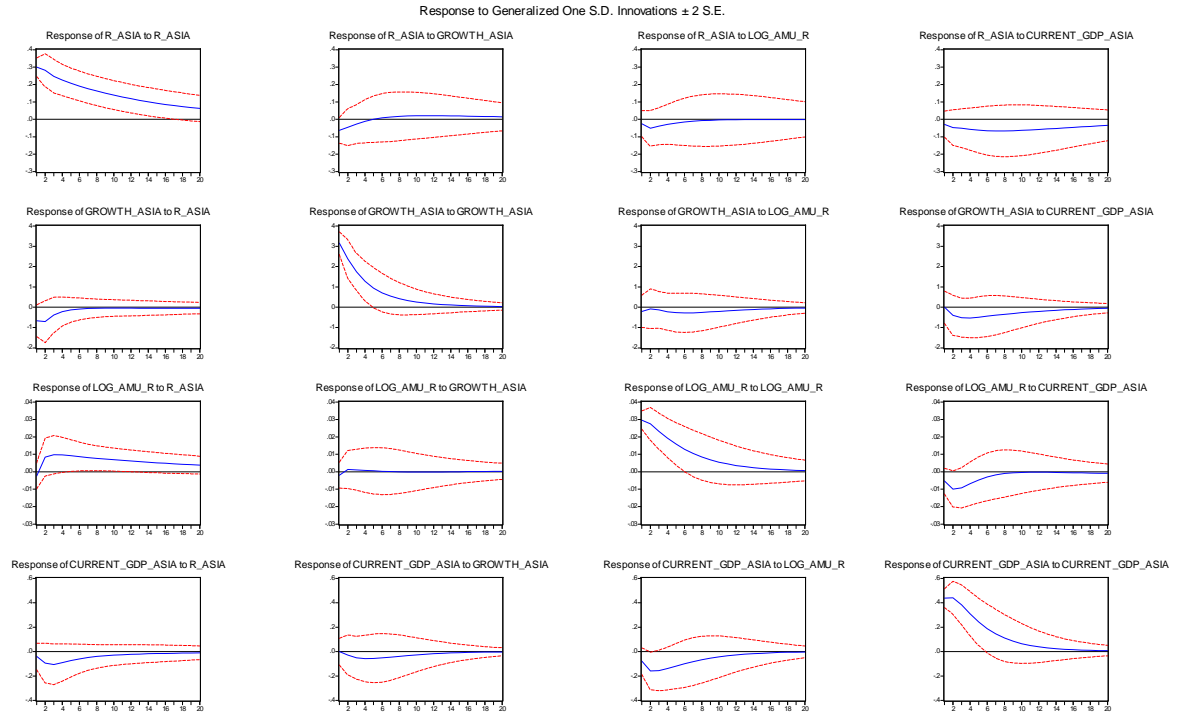


Figure 18: Causalities among the economic variables in Model EA1
1991Q1-2006Q4

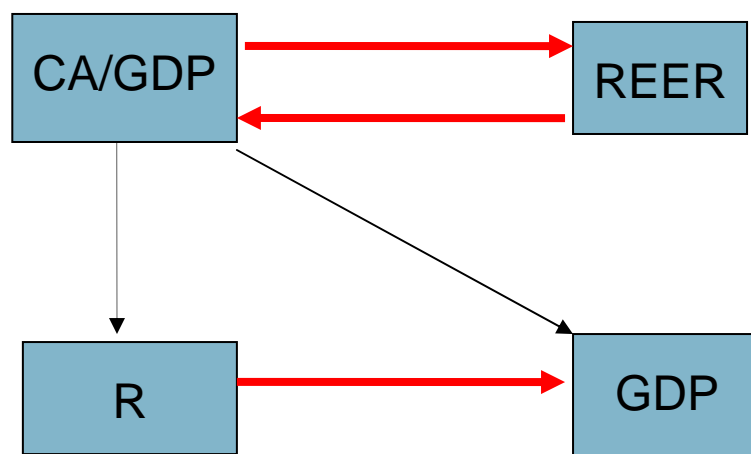


Figure 19: Causalities among the economic variables in Model EA2
1991Q1-2006Q4

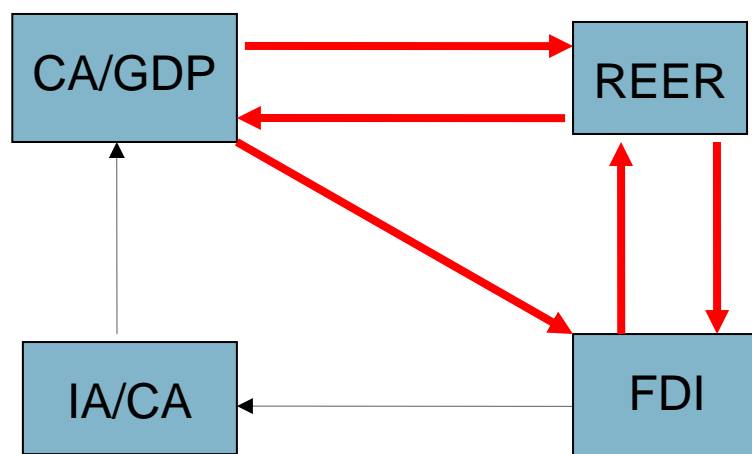


Figure 20: Causalities among the economic variables in Model EA3
1991Q1-2006Q4

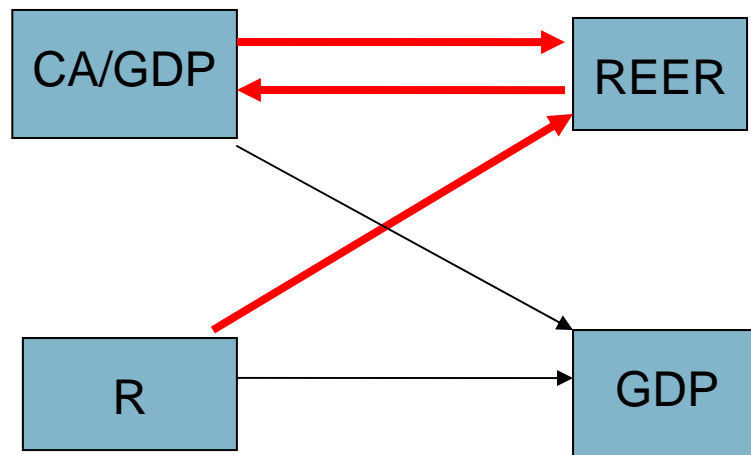


Table 1: Exchange rate adjustment to current account imbalance

Country/region	Japan		East Asia excluding Japan		East Asia including Japan
Models	Model J1	Model J2	Model EA1	Model EA2	Model EA3
Responses to 1% appreciation during 50Q					
Appreciation	2.56%	10.48%	18.52%	31.4%	6.79%
Reduced CA surplus	0.23%point	0.73%point	1.53%point	3.61%point	0.87%point
Necessary appreciation during 50Q for 2%point reduced CA surplus	22.3%	28.7%	24.2%	17.4%	15.6%

Analytical period: 1991Q1 to 2006Q4

Model J1: four-variable VAR model which includes the real effective exchange rate of the Japanese yen, a ratio of Japanese current account to GDP, Japanese real interest rate, and Japanese GDP growth rate.

Model J2: four-variable VAR model which includes the real effective exchange rate of the Japanese yen, a ratio of Japanese current account to GDP, a ratio of outward FDI to domestic investments, and a ratio of income account to current account.

Models EA1 and EA3: four-variable VAR model which includes the real exchange rate of the weighted average of East Asian currencies in terms of a currency basket of the US dollar and the euro, a ratio of East Asian current account to GDP, East Asian real interest rate, and East Asian GDP growth rate

Model EA2: four-variable VAR model which includes the real exchange rate of the weighted average of East Asian currencies to a currency basket of the US dollar and the euro, a ratio of East Asian current account to GDP, a ratio of inward FDI to domestic investments in East Asia, and a ratio of income account to current account in East Asia